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set on fire by the mere heat of steam acting upon a wooden casing around a steam-chest, which had been for some time subjected to heat communicated from the steam within.

Dr. R. E. Rogers and Prof. Frazer made some remarks on the subject, and urged the necessity of caution in the construction of heating apparatus in buildings.

The Committee on the sale of the Hall reported progress.

The Secretary was directed to answer the letter read at last meeting from the Imperial Society of Naturalists of Moscow.

Stated Meeting, October 19.

Present, twenty-eight members.

Judge KANE, Vice-President, in the Chair.

Letters were read:—

From the Royal Society of Sciences at Stockholm, dated Oct. 23, 1854, and May 31, 1855;—from the Royal Danish Society of Sciences, dated Copenhagen, May 8, 1855;—from the Royal Saxon Society of Sciences, dated Leipzig, May 18, 1855;—from the Royal Geographical Society, 15, Whitehall Place, June 2, 1855;—from the Society of Antiquaries, dated Somerset House, London, July 25, 1855;—from the Ethnological Society, dated 23 Newman street, Oxford street, July 25, 1855,—severally announcing donations for the library:—

From the Royal Lombardy Institute of Science, Letters and Arts, dated Milan, June 22, 1854, acknowledging the receipt of Vol. X. Part 2, of the Transactions, and of the Proceedings to No. 48,—and also announcing a donation for the library:—From the Royal Geographical Society of London, dated 15 Whitehall Place, Nov. 14, 1854, acknowledging the receipt of No. 47 of the Proceedings: and—

From the Royal Danish Society of Sciences, dated Copenhagen, June, 1855, returning thanks for Vol. X. Part 3, of the Transactions, and for Nos. 49, 50 of the Proceedings of this Society.

The following donations were announced:—

FOR THE LIBRARY.

- Memorie della Reale Accademia delle Scienze di Torino. Serie Seconda. Tomo XIV. Torino, 1854. 4to.—*From the Academy.*
- Giornale dell' I. R. Istituto Lombardo di Scienze, Lettere ed Arti, e Biblioteca Italiana. Nuova Serie. Fascicoli XIX.—XXXVI. Milano, 1852–5. 4to.
- Memorie dell' I. R. Istituto Lombardo. Vol. IV. Milano, 1854. 4to.—*From the Royal Lombardy Institute.*
- Kongl. Vetenskaps-Akademiens Handlingar, för år 1852, 1853. I. Ofversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, 1853, 1854.
- Årsberättelser om Botaniska Arbeten och Upptäckter, för Åren 1845–50, till K. V. A. af Joh. Em. Wikström.
- Berättelse om Framstegen i Fysik under år 1851, afgifven till Kongl. V. A. af E. Edlund.
- Berättelse om Framstegen i Insekternas, Myriapodernas och Arachnidernas Natural-historia, för 1851 och 1852, till K. V. A.—af C. H. Boheman. Stockholm. 8vo.—*From the Royal Academy of Sciences, Stockholm.*
- Oversigt over det Kgl. Danske Videnskabernes Selskabs Förhandlingar, og dets Medlemmers Arbejder i Aaret 1854; af Selskabets Secretair, G. Forschhammer, &c. Kiøbenhavn. 8vo.—*From the Royal Danish Society of Sciences.*
- Bulletin de la Société de Géographie. IV. Série. Tome VIII. Paris, 1854. 8vo.—*From the Geographical Society, Paris.*
- Annales des Mines. V. Série. Tome V. 3 livr. de 1854. Tome VI. 4 livr. de 1854. Paris, 8vo.—*From the Engineers of l'Ecole des Mines.*
- Berichte über die Verhandlungen der Königl. Sächsischen Gesellschaft der Wissenschaften zu Leipzig. Math. Phys. Classe, 1853, III.—1854. I. II.
- Die Theorie des Aequatoreals; P. A. Hansen.
- Ueber die Rationalität der Tangenten-Verhältnisse Tautozonaler Kristallflächen; C. F. Naumann.
- Die Theorie der Kreisverwandtschaft in rein geometrischer darstellung; A. F. Möbius. Leipzig, 1855.—*From the Royal Saxon Society of Sciences.*
- Compte-Rendu Annuel adressé à S. Exc. M. de Brock, Ministre des Finances, par le Directeur de l'Observatoire Physique Central,

- A. T. Kupffer. Année 1853. St. Petersbourg, 1854. 4to.—*From the Author.*
- Archæologia : or Miscellaneous Tracts relating to Antiquity, published by the Society of Antiquaries of London. Vol. XXXVI. 1855. 4to.
- Proceedings of the Society of Antiquaries, of London. Vol. III. Nos. 41, 42 : with list of the Fellows, April 23, 1855. London. 8vo.—*From the Society.*
- Memoirs of the Royal Astronomical Society. Vol. XXIII. being the quarto half-volume for the session 1853-4. London. 4to.
- Monthly Notices of the Royal Astronomical Society. Vol. XIV. Nov. 1853, to June, 1854. London. 8vo.—*From the Society.*
- Journal of the Royal Geographical Society. Vol. XXIV. London, 1854. 8vo.—*From the Society.*
- Journal of the Ethnological Society of London. Vol. II. 1850 :—with the Address of Richard Cull, Esq. Hon. Secretary, May 25, 1855. London. 8vo.—*From the Society.*
- Proceedings of the Royal Society of London. Vol. VII. Nos. 11, 12, 13. London. 8vo.
- Astronomical and Meteorological Observations made at the Radcliffe Observatory in the year 1853, under the superintendence of Manuel J. Johnson, M.A. Radcliffe Observer. Vol. XIV. Oxford, 1855. 8vo.—*From the Radcliffe Trustees.*
- Magnetical and Meteorological Observations at Lake Athabasca and Fort Simpson, by Capt. J. H. Lefroy, R.A.—And at Fort Confidence, in Great Bear Lake, by Sir John Richardson, C.B. M.D. London, 1855. 8vo.—*From Colonel Sabine.*
- Archives du Muséum d'Histoire Naturelle, publiées par les Professeurs-Administrateurs de cet établissement. Tome VII. livraisons 3, 4. Tome VIII. livraisons 1, 2. Paris, 1855. 4to.—*From the Museum.*
- Proceedings of the American Association for the Advancement of Science. *Eighth Meeting*, held at Washington, D. C. May, 1854. Cambridge, 1855. 8vo.—*From the Association.*
- Proceedings of the Boston Society of Natural History. Vol. V. No. 14. Sept. 1855. Boston. 8vo.—*From the Society.*
- Journal of the Franklin Institute. 3d Series. Vol. XXX. No. 4. Oct. 1855. Philadelphia. 8vo.—*From the Institute.*
- The African Repository. Vol. XXXI. No. 10. Oct. 1855. Washington. 8vo.—*From the American Colonization Society.*

The American Journal of the Medical Sciences. No. LX. New Series. Oct. 1855. Philadelphia. 8vo.—*From Dr. Isaac Hays, Editor.*

Medical News and Library. Vol. XIII. No. 154. Oct. 1855. Philadelphia. 8vo.—*From Blanchard & Lea.*

Tide Tables for the principal Sea Ports of the United States: by A. D. Bache, Superintendent of the U. S. Coast Survey. New York, 1855. 8vo. —*From the Author.*

Messrs. Eckfeldt and Du Bois presented a communication as supplementary to their paper on *aluminum*, read at a former meeting.

A few prefatory words might properly be expended upon the *name* of this metal, which is variously written *aluminum*, and *aluminium*. By the analogy of nomenclature, in which we have *scda* and *sodium*.—*potassa* and *potassium*, it would seem proper to join to *almina*, *aluminium*. This title is accordingly used by some eminent writers on chemistry; but the great majority write *aluminum*; and if this metal is destined to come into common use, it is very desirable to drop any syllables that can be dispensed with, to make the word easy of pronunciation, and to prevent barbarous misnomers. It is hardly to be believed, that the mass of uneducated persons will take the trouble to say *aluminium*.

Passing to more important points, we have subjected our small samples of this metal to such tests and treatment as would indicate, in some degree, the position which it is entitled to, amongst the metals, and the practical uses to which it may be applied. This work, it is true, has been done already, but the reported results being somewhat confused and conflicting, we have thought it proper to add something to the testimony.

In cool nitric acid, of the strength of 32° Beaumè, there is no action upon aluminum. In the same solvent, standard silver would be attacked immediately, though moderately.—The same acid being brought up to such a heat as to give off vapour, the action upon aluminum commences, and, after a considerable time, solution would be effected.—But this is not the proper solvent of the metal.

In strong sulphuric acid, with or without heat, there is no action; but by adding water, the solution is complete. Here there is a remarkable likeness to iron and zinc; and as remarkable an antagonism to silver.

In muriatic or hydrochloric acid, of ordinary strength, with or without heat, the action is violent, and the solution perfect.

As to its behaviour in water, we find, upon several trials, that it is not tarnished by boiling in distilled water, but it is decidedly discoloured by boiling in hydrant water; and without appreciable loss in either case. The tarnish from hydrant water is, of course, owing to the contact of some earthy alkaline matter held in solution.—The lively action which takes place in boiling water, and which, at first, looks like a process of solution of the metal, or a decomposition of the water, is simply because the metal, in its rapid conduction of heat, is a nucleus or point for generating and letting off the bubbles of steam.

With further reference to culinary or housekeeping uses, we tried the effect of ordinary vinegar, at boiling heat. There was no action nor any loss.

Exposed to the vapours of sulphuretted hydrogen, which quickly blackened fine silver, there was no discolouration of aluminum.—Yet it is certain, that a sufficiently long exposure to the atmosphere will impart a slightly blueish tint; as we have seen, after pickling or whitening the metal in nitric acid. This, of course, is due to the oxygen in the air.

The effects of *heat*, upon this metal, are next to be stated.—There is a well-known distinction among metals, by which some are classified as *noble* or *precious*, and others as *base*. It is quite unnecessary to review the grounds of this distinction; we may merely observe, that the grand test of it is found in the bone-ash vessel, or cupel. The precious metals are not absorbed into such a vessel, under heat; the base metals are carried down, and disappear. Subjected to this trial, the metal under consideration, however precious it may be, in the market, or however valuable it may become to the manufacturer, does not take its stand amongst the precious metals. It has a good degree of fixedness, and, for a while, though somewhat enveloped by the great metallurgic solvent, lead, it still remains “above ground,” though at a full red heat: but the addition of more lead will hasten the oxidation, and the whole is carried down into the pores of the cupel.—Still it is a more fixed and less oxidable metal than such as tin, zinc, lead, and others; and this, with some collateral characters, should assign it a medium place, between the noble and the base.

Its *melting-point* has all along been stated to be higher than that of cast-iron; but since it has been produced in the ingot, by M. De-

ville's process, it is rated to melt at a point a little higher than that of zinc. The fact is, when strictly in a metallic state, it melts or becomes tremulous and plastic, yet not quite fluid, at a low red heat; but as soon as a coating of oxide, or alumina, is formed, it resists a far higher degree of heat; and the reduction of that oxide is a very important part of the secret of M. Deville.

Its *ductility* is a very marked and important characteristic; one of our specimens being rolled down to $\frac{3}{1000}$ inch. The rolling requires some care and management, and we do not feel qualified to speak particularly on this point, from the small samples we have had to operate upon.

Lastly, although it is out of the line of our profession, the comparative *rigidity*, or power of resisting pressure, is so very important an element, in determining the uses to which a metal may be applied, that we have made a trial of this also, with a very simple, though apparently accurate apparatus. Rolled strips of standard silver, iron, copper, zinc, and aluminum, equal in length, breadth, and thickness (by a very delicate gauge in this latter measurement), were rested upon cross pieces at the ends, and a pressure of given weights applied precisely at the middle of the strip, to bear down to a stopping-point, making but a small deflection or curve. The weights required to bring each strip down to this point, were relatively as follows:

| | | | | | | |
|---------------------------------------------------------------------|---|---|---|---|---|-----|
| Standard silver (composed of nine-tenths silver, one-tenth copper), | | | | | | |
| | . | . | . | . | . | 114 |
| Wrought iron, | . | . | . | . | . | 154 |
| Copper, | . | . | . | . | . | 123 |
| Aluminum, | . | . | . | . | . | 123 |
| Zinc, | . | . | . | . | . | 28 |

From the foregoing particulars, any one may imagine for himself what purposes this metal may be applied to. Wherever it is desirable to concentrate strength, with as little weight as possible, this extraordinary material will, of course, be thought of, and tried. It has already been used for the beams of fine balances, and for the works of watches; and some sanguine minds, which imagine that the air may yet be made a highway of travel, have considered aluminum as a timely offering, for such metallic machinery as may be indispensable.

Very much depends, manifestly, upon the price at which this article can be furnished, when the demand will justify its manufacture upon

a large scale. Prof. Booth expresses to us the clear conviction, that inasmuch as sodium, which forms the basis of the manufacture of aluminum, can be made at a comparatively low price, perhaps fifty cents a pound, the metal in question will eventually be sold at nearly or quite the same rate. Such a consummation would be likely to open the way for withdrawing the copper cent from our currency, and substituting for it a light and cleanly coin of the new metal. In the mean time, it will be wise to wait until it has been found useful for other purposes; for nothing will be acceptable as coin, unless it be good for something else.

Judge Kane mentioned, for the information of the Society, that Dr. E. K. Kane returned, on last Thursday, from his expedition to the Arctic regions, having mapped out his discoveries as far as north latitude $82^{\circ} 30'$. He had hoped for Dr. Kane's attendance with the Society this evening; but this had been accidentally prevented.

Mr. Justice and Mr. Lea described the appearance of the aurora borealis on Thursday evening last, as observed by them,—and general remarks on the subject were made by Prof. Frazer, Dr. Boyé and others.

The Secretary reported that he had responded to the letter from the Imperial Society of Naturalists of Moscow, as directed at the last meeting.

The Society then proceeded to the stated business of the meeting, the balloting for candidates for membership.

All other business having been concluded, the ballot boxes were opened by the presiding officer, and the Rev. ALBERT BARNES, of Philadelphia, was declared to be duly elected a member of the Society.

Stated Meeting, November 2.

Present, twenty-two members.

Dr. DUNGLISON, Vice-President, in the Chair.

A letter was read:—

From the Rev. Albert Barnes, dated Philadelphia, Oct. 23, 1855, acknowledging the receipt of notice of his election as a member of the Society.